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PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIIICaS 2024)



*“Flourish and Nurturing Sustainable
Innovation for a Prosperous Nation”*

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.

Foreword Rector



Assalamualaikum warahmatullahi Wabarakatuh,
Salam Sejahtera, Salam Malaysia MADANI and
Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most
Merciful.

It is a great honor to welcome you to the Johor
International Innovation, Invention, Competition, and
Symposium 2024 (JIIICaS 2024). This event

connects various disciplines, focusing on education and engaging educators,
students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and
determination to turn those ideas into reality. The remarkable projects
showcased today highlight the dedication and spirit of all participants.
Initiatives like this not only explore new technologies but also cultivate skills
and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor
Branch, we are fully committed to fostering a dynamic culture of innovation,
promoting the commercialization of new products, and encouraging
meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all
sponsors, judges, the College of Computing, Informatics and Mathematics,
UiTM Pasir Gudang Campus as the event organizer, as well as to the
researchers and participants for their hard work in making this event a
success. Let us continue striving for innovation and excellence. May the
ideas presented today inspire us and lay the groundwork for future
achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
Johor Branch

(A-SS054) SMART SHOPPING CART USING RADIO FREQUENCY IDENTIFICATION (RFID)

Aliya Adriana Azlan¹, Ku Siti Syahidah Ku Mohd Noh²

¹Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA,
Cawangan Melaka Kampus Jasin, 77300 Merlimau, Melaka, Malaysia

²Centre of Foundation Studies, Universiti Teknologi MARA, Cawangan Selangor
Kampus Dengkil, 43800 Dengkil, Selangor, Malaysia

Corresponding author: kusyahidah@uitm.edu.my (Ku Siti Syahidah Ku Mohd Noh)

ABSTRACT

Habits of buying goods without checking the price first and purchasing unnecessary items often lead to overspending the monthly budget. Therefore, verifying the price at the price checker counter is essential to ensure the displayed price matches the scanned price. Additionally, checking prices before purchasing items allows customers to choose supermarkets offering lower prices. However, this can be troublesome if customers have many items to purchase. A Smart Shopping Cart can resolve this issue by allowing customers to check prices instantly as they add items to the cart. The Smart Shopping Cart can also keep a running total of the prices of selected items and subtract prices for items removed from the cart. This enables customers to reconsider unnecessary purchases and stay within their budget, enhancing their shopping experience. The use of Radio Frequency Identification (RFID) technology in these Smart Shopping Cart improves purchasing efficiency. In summary, this smart shopping cart benefits both customers and supermarket owners by streamlining the selling and buying process.

Keywords: RFID, RFID card, smart shopping cart, Arduino

1.0 INTRODUCTION

In today's fast-paced world, efficient and budget-conscious shopping is a growing priority for many customers. Traditional shopping methods often result in overspending due to a lack of real-time price awareness and the inconvenience of manually checking prices. Additionally, long queues at payment counters due to inefficient barcode scanning further exacerbate the shopping experience.

To address these challenges, the development of a Smart Shopping Cart equipped with RFID technology offers a promising solution. This innovative shopping cart not only assists customers in managing their budgets by providing real-time price tracking but also enhances the overall shopping efficiency by leveraging the capabilities of RFID technology.

RFID provides a significant advantage over traditional barcode systems by enabling the automatic detection of items within a certain range. This eliminates the need for manual scanning, thereby reducing waiting times at checkout and streamlining the entire shopping process.

2.0 OBJECTIVE

The primary objectives of this project are twofold: first, to help customers maintain their monthly budgets by offering instant price visibility and total cost calculations as they shop; and second, to improve the efficiency of the purchase process, making shopping a more seamless and enjoyable experience. By integrating RFID technology into Smart Shopping Carts, the aim is to revolutionize the retail experience for both customers and supermarket owners, creating a more efficient, convenient, and budget-friendly shopping environment.

3.0 METHODOLOGY

This project encompasses both software and hardware development. The simulation was conducted using Proteus software. Upon completing the simulation, the process of creating the Printed Circuit Board (PCB) begins. The project utilizes an Arduino microcontroller, RFID card, MFRC522 reader, LCD screen, push button, LEDs, and a buzzer. The prototype of Smart Shopping Cart is illustrated in Figure 1, with dimensions of 20x15x8 cm.



Figure 1: Prototype of Smart Shopping Cart

Figure 2 explains the flow of this project. Firstly, the switch must be turned on to activate the entire system. When the card is tagged on the MFRC522 reader, it reads the information stored in the card's memory. If the card is registered, the price, name of item and quantity of the item will be displayed on the LCD screen. If an unregistered card is scanned, the system will trigger a specific error function and allow for another card to be read.

Once the customer has finished shopping, they need to press a designated button to display the total number of items scanned and the overall cost of the products in the cart. Pressing a second button will reset the calculated items and prices, preparing the system for the next user.

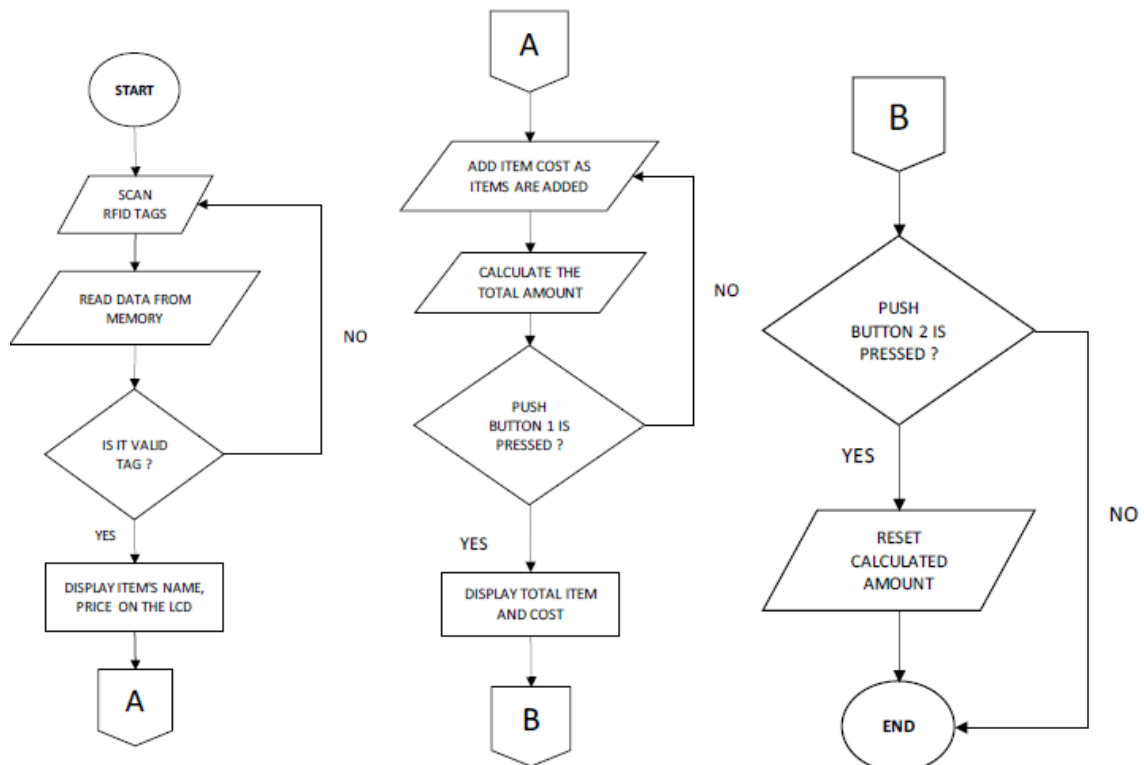


Figure 2: Flowchart of the project

4.0 RESULTS

When the item, represented by the RFID card, is scanned at the MFRC522 reader, its name and price are displayed on the LCD screen, as shown in Figure 3. Once items have been selected for purchase, the LCD screen will then display the total price that customers need to pay and total item purchase, as depicted in Figure 4.

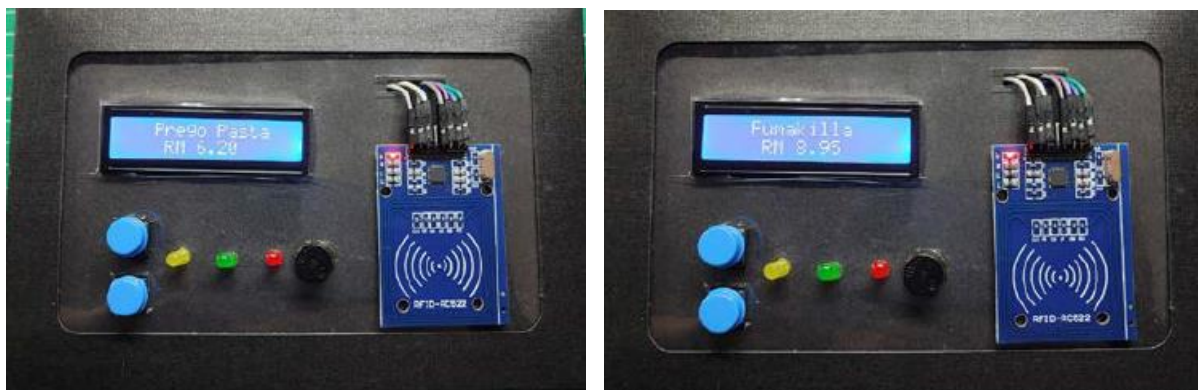


Figure 3: Example of item price after scan



Figure 4: Total item purchase and total price

This smart shopping system is incredibly user-friendly. Customers simply touch the desired item at the scanner. A green LED confirms that the RFID card has been successfully registered, whereas a red LED signals an error or indicates that the card is not registered.

Regarding the buzzer, different frequencies are used for specific alerts. An unregistered card triggers the buzzer at 1kHz while a registered card activates the buzzer at 2kHz. Higher frequencies produce higher-pitched sounds, while lower frequencies produce lower-pitched sounds. This setup ensures that customers are promptly alerted to the status of the scanning process, enhancing their awareness and interaction with the system.

This project is cost-effective due to its use of affordable components, and its compact size makes it practical for attachment to a shopping basket and trolley. Every supermarket can benefit from deploying these Smart Shopping Cart to assist customers in managing their budgets effectively and avoiding long queue.

5.0 CONCLUSION

In conclusion, the Smart Shopping Cart with RFID Technology represents a transformative innovation in retail. By integrating RFID technology, this system enables real-time tracking of items and prices, empowering customers to make informed purchasing decisions and manage their budgets more effectively. The use of affordable components and its practical, compact design make it a feasible solution for supermarkets to adopt widely. This technology not only enhances the efficiency of shopping processes by reducing checkout times but also improves overall customer satisfaction. As retail continues to evolve, embracing Smart Shopping Carts with RFID Technology promises to elevate the shopping experience and optimize operational efficiency in supermarkets.